NEWTON

*Fresh Perspectives / Dynamic Solutions*

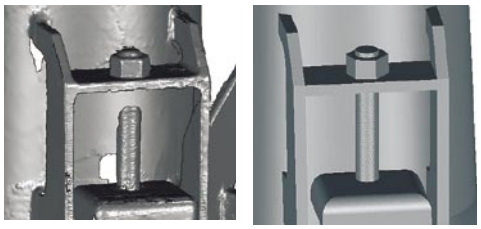
# Underwater Laser Scanner

## Model M210UW

**The M210UW is a laser-based revolutionary underwater non-contact, measuring system with sub-millimeter precision.**

**The system delivers precise dimensions with an accuracy to +/- .0004 (0.01mm), enabling 3-D CAD model production.**

- Sophisticated, Newton-developed algorythms compensate for refraction, turbulence and suspended particulates.
- The unit outputs a point cloud so detailed, that when utilized with industry standard 3D software, a measurable CAD model can be generated.
- Provides precise dimensioning of as-built features, cracks, welds, rust, pitting and other deformities on ships, marine substructures, submerged pipes and valves.
- Constructed of rugged, industrial-grade hardware and electronic components.
- Cable-supplied and rated to 100 meter depths. Other available models are designed to be ROV-mounted and rated to much greater depths.



(L) An M210UW underwater scan of a bracket
(R) The same rendered as a measurable CAD file

M210UW deployed by a civil engineering diver in a waterside construction site in Germany.

M210UW control console

### *M210UW Scanner Operation*

- **Precision by triangulation** - An internal drive sweeps a laser line across the target and the high resolution camera records all deformations of the beam, thus creating a point cloud.
- **The M210UW can scan a target as close as 6 in.** (150mm) and out to 3 ft. (0.9 m), for a scan coverage area of 2.1 ft. x 2.9 ft. (64 cm x 88 cm). The system measures underwater targets up to an accuracy of +/-.0004 in. (0.01 mm).
- **M210UW software can capture much larger target areas** by combining several point clouds together to form larger composites.
- **Operators may select from several levels of scan quality**. The shortest, coarse scan takes 15 seconds; the longest and most detailed takes about three minutes.
- **In the visual observation mode**, the LED ring array illuminates the target area and the camera transmits a monochrome image to the control console screen.
- **Deployment of the scanner head** can be by a pole mounting, articulated arm, ROV, or other robots.
- **Multi-modal application** - The versatile M210UW is designed to operate in either water or air.

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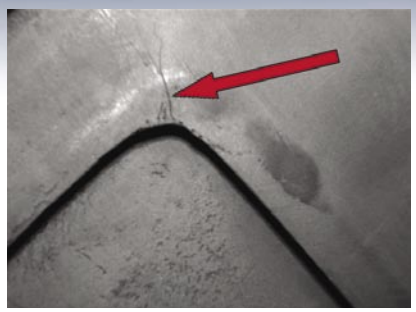

**The left photo** shows a crack in the corner of an underwater steel hatch in a difficult location. It is possible to determine the approximate length of the crack by various means, but the width and surface condition can not be accurately determined.
**A M210UW scan** (in blue) of the area, rendered to a CAD model, records the precise crack width at any point on its length.***

## *M210UW Technical Specifications & System Performance*

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| Item | Control Console | Laser/Camera Head |
|---|---|---|
| Height | 9.5 in. (241.3 mm) | 4.250 in. (107,950 mm) |
| Width | 15 in. (381 mm) | 4.625 in. (117,475 mm) |
| Length | 22.5 in. (571.5 mm) | 9.375 in. (238,125 mm) |
| Weight (in air) | 29.2 lbs. (13.24 k) | 8 lbs. (3.6 k) |
| Weight (in water) | --- | 2 lbs. (1 k) (plus cable weight) |
| Cable | LLDPE polyurethane jacket, gel filled - 150 ft. (45.72 m) (other lengths available) | --- |
| Construction | Metal electronics cabinet within a molded, high-impact, airline-transportable case | Machined from solid billet of 6061T6 aluminum stock |
| Laser power | --- | 40 mW |
| Video camera | --- | High Resolution Monochrome |
| LED ring array | --- | 2,320 lumens |
| Fittings & retainers | --- | 300 series stainless steel |
| Windows | --- | Fused silica or optical glass |
| Mounting attachments | --- | Four grouped 1/4-20 UNC threaded mounting holes on four sides of case (Metric threads available) |
| Output ports | Ethernet, USB, DVI & HDMI | --- |
| Standard operating temperature | 40° to 110° F (5° to 43° C) | 110° F (43.3° C ) in water - 100% duty cycle |
| Storage temperature | 0° to 125° F (-18° to 52° C) | 0° to 160° F (- 18° to 71° C) |
| Power input voltage/current | 100 to 240 VAC 50 to 60 cycle | Powered by control unit |
| Data storage | Internal solid state & USB stick data | --- |
| Output format | .ply point cloud file | --- |
| Data file size | Approximately 100 MB per scan | --- |
| Maximum scanner-to-target distance | --- | 36.0 in. (900mm) |
| Minimum scanner-to-target distance | --- | 6.0 in. (150mm) |
| Maximum Resolution accuracy (after processing with 3-D software) | --- | +/-0.0004 in. (0.01mm)* |
| Scan range | --- | 6.0 in. (150 mm) to 36 in. (900 mm) |
| Watertight depth rating | --- | 320 ft. (100 m) |

| Depth of Field Distance *(Distance to object)* | Field of View *Height ---------- Width* | | Raw Accuracy *(single Point Cloud point, rms)* | Approximate CAD Model Accuracy** |
|---|---|---|---|---|
| 6 in. (150 mm) | 150 mm | 190 mm | +/-.002 in. (0.05 mm) | +/-.0004 in. (0.01 mm)* |
| 12 in. (300 mm) | 250 mm | 330 mm | +/-.004 in. (0.10 mm) | +/-.0008 in. (0.02 mm) |
| 18 in. (450 mm) | 350 mm | 470 mm | +/-.008 in. (0.20 mm) | +/-.0012 in. (0.03 mm) |
| 24 in. (600 mm) | 450 mm | 600 mm | +/-.014 in. (0.35 mm) | +/-.0025 in. (0.06 mm) |
| 36 in. (900 mm) | 650 mm | 880 mm | +/-.028 in. (0.70 mm) | +/-.0060 in. (0.15 mm) |

***After 3rd-party 3D software processing*

*All M210UW accuracy is related to the field of view, distance from the object to be measured and can vary by the parameters of the object. Consult Newton for the specific accuracy that can be obtained for your proposed object.

Revised 041415

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